



ENVIRONMENTAL PRODUCT DECLARATION

HOT-ROLLED REINFORCING STEEL FOR CONCRETE IN BARS AND COILS

 **ALFA ACCIAI**

Gruppo
 **ALFA ACCIAI**



Based on:

PCR ICMQ-001/15 v3

EN:15804:2012+A2:2019

UNI EN ISO 14025:2010

Certification N°:

EPDITALY0004

Product CPC code:

41

Date of issue:

2016/04/12

Revision date:

v1 - 2021/08/03

Valid until:

2025/12/09

GENERAL INFORMATION

EPD REFERENCES

EPD OWNER: ALFA ACCIAI, VIA SAN POLO 152, 25134, BRESCIA – ITALY; MANUFACTURING PLANT IS LCOATED IN THE SAME SITE

PROGRAM OPERATOR: EPDITALY, VIA GAETANO DE CASTILLIA 10, 20124 MILANO - ITALY

INDEPENDENT VERIFICATION

This declaration has been developed referring to the EPDItaly, following the last version of "Regolamento di EPDItaly"; further information and the document itself are available at: www.epditaly.it. EPD document valid within the following geographical area: Italy and other countries worldwide according to sales market conditions.

CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 v3)
PCR review conducted by Daniele Pace, contact via info@epditaly.it

Independent verification of the declaration and data, according to UNI EN ISO 14025:2010

Third party verifier: ICMQ SpA, via De Castilia, 10 20124 Milano (www.icmq.it)

EPD process certification
(Internal)

EPD verification
(External)

Accredited by: Accredia

Environmental declarations published within the same product category, though originating from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804.

CONTACTS

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Technical support to Alfa Acciai was provided by Life Cycle Engineering, Italy.
(info@studiolce.it, www.lceengineering.eu).



1. ALFA ACCIAI GROUP

Alfa Acciai Group comprises several well-established companies specialized in various areas in the production of steels for reinforced concrete, a guarantee of products and services qualifying the Brescia-based group as an excellent business partner in a wide range of sectors, first and foremost in building construction.

Being involved in the entire steel production chain, with an integrated system upstream and downstream of the parent company, the Alfa Acciai Group is able to meet its customers' operating requirements and to guarantee a superior standard of quality at all stages of the production process.




ALFA ACCIAI, the Brescia-based parent company, is one of the largest EAF steel mills in Italy. There is a steel shop department with 2 EAF (electric arc furnaces), 2 LF (ladle furnaces) and 2 continuous casting machines (10 lines). The hot rolling department is equipped with 3 rolling mills for rebars, coils and wired rod; the cold rolling department has 12 cold rolling mills and 5 welded mesh machines. This EPD is specifically about steel bars and coils for concrete produced in Brescia plant.



ACCIAIERIA DI SICILIA is the only steel mill operating in Sicily. High production capacity, state-of-the-art technology and a wide range of products have earned the company a good position in the European steel making industry and help it make good use of its strategic location for serving south Mediterranean markets.



ALFA MONTIRONE, which was set up in June 2016, has recently took over the Montirone-based steel-making line of business of the Stefana Group. The steel mill, which has been decommissioned for some time, is located in the province of Brescia. The site will be reclaimed and renovated in the coming years for its new intended use. The acquisition entailed for Alfa Acciai the taking on of all the existing 70 workers.



TECNOFIL, acquired by Alfa Acciai in September 2016 is one of Italy's leading wire drawing mills specialising in galvanized, copper-coated, annealed and plastic-coated wire and wire band for use in building construction, household appliances, automotive and numerous other everyday life applications. Over the years, TECNOFIL has developed its vocation to innovation of its production processes and constant search for tailored solutions for its national and international customers.



FERROBERICA is the largest company in Italy involved in the pre-shaping and laying of reinforcing steel for all kinds of structural work, for roads, railway, and maritime infrastructures, as well as public, industrial and civil buildings. The company handles the final stage of the group's production chain and guarantees a high standard of quality for the end users, i.e. leading building contractors.

SCOPE AND TYPE OF EPD

THE APPROACH USED IN THIS EPD IS "CRADLE TO GATE WITH OPTIONS" ONE

TABLE OF MODULES

| PRODUCT STAGE | | | CONSTRUCTION PROCESS STAGE | | USE STAGE | | | | | | | END OF LIFE STAGE | | | | BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES |
|---------------------|-----------|---------------|-------------------------------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|-----------------------------|-----------|------------------|----------|---|
| Raw material supply | Transport | Manufacturing | Transport from the gate to the site | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De- construction demolition | Transport | Waste processing | Disposal | Reuse - Recovery - Recycling potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| X | X | X | X | MND | MND | MND | MND | MND | MND | MND | MND | X | X | X | X | X |

SOFTWARE: SimaPro ver. 9.1.1.1

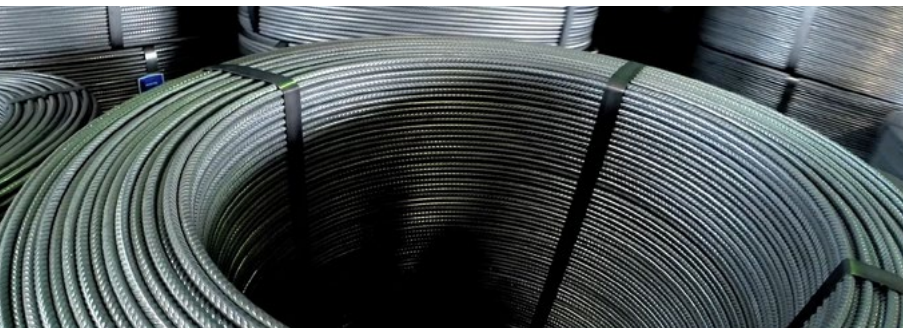
MAIN DATABASE: Ecoinvent 3.6

REPORT LCA: Life Cycle Assessment (LCA) for hot and cold rolled structural steel and for Sinstone recycled aggregate produced by Alfa Acciai for EPD® purposes - Final Report

GEOGRAPHICAL SCOPE OF THE EPD: World according to sales market conditions

TYPE OF EPD: specific for hot rolled steel products

2. THE PRODUCT



HOT-ROLLED REINFORCING STEEL FOR CONCRETE IN BARS AND COILS

This EPD refers to construction products, hot rolled structural steel bars and coils, produced at Alfa Acciai plant placed in Brescia (Italy), with electric arc furnace route, starting from post and pre consumer steel scraps. The homogeneous and repeatable mechanical features of steel guarantee excellent performance in any type of construction and geographical area, since they have high ductility.

EPD reference products have a chemical composition in compliance with national regulation of destination countries where they are sent. In general, the main materials of the final product are: *iron > 96%; alloy elements* (e.g. manganese, silicon, carbon) *2% c.a.; other elements* (e.g.. copper, nickel, chromium), *complementary to 100%*.











DECLARED UNIT

According to EN:15804, the declared unit is **1 ton of hot rolled product**

| INFORMATION | DESCRIPTION |
|--|---|
| Product identification | Hot-rolled reinforcing steel for concrete in bars and coils |
| Product features | Bars: Diameters from 6 mm to 32 mm Length up to 18 m Weight: 2 300 kg per bundle Coils: Diameters from 6 to 16 mm Weight from 1 450 to 3 000 kg according to the diameter |
| Product properties (under EN10080:2005) | Steel coming from post and pre consumer steel scraps produced in electric arc furnace route (EAF) and further hot rolling process. Adherence and surface geometry f_R or f_p : - for $5 \leq \varnothing \leq 6$ mm f_R or f_p 0.035; - for $6 < \varnothing \leq 12$ mm f_R or f_p 0.040; - for $\varnothing > 12$ mm f_R or f_p 0.056. Weldability: $C_{eq} < 0.52$ Typical yield stress: $400 \text{ MPa} \leq C_v \leq 600 \text{ MPa}$ Elongation: $A_{gt} > 5\%$ Successful in bend and rebend test Successful in strength test and oligocyclic strength test Products covered by this EPD, year 2020: 580 518 t Total production, for selling purpose, year 2020: 1 104 545 t |
| Plant features | On-site air emission control system On-site waste water control system On-site system to recycle water used in process In/out materials/products and melting process monitored to prevent nuclear radiation Plant air emissions accounted under ETS (Emission Trading System) |

ENVIRONMENTAL PERFORMANCE

The detailed environmental performance (in terms of use of resources, pollutant emissions and waste generation) is presented for the three phases, Upstream, Core and Downstream and related sub-phases (A1-A2-A3-A4-C1-C2-C3-C4-D). The numbers reported in the following tables are the outcome of rounding. For this reason total results could slightly differ from the sum of contributions of the different phases.

| ENVIRONMENTAL IMPACTS | | | | | | | | | | | | | |
|---|-----------------------|---|---|---|---|---|---|---|---|-----------------|---|-------|---|
|  POTENTIAL ENVIRONMENTAL IMPACTS | UNITS / D.U. | UPSTREAM | | CORE PROCESS | | | | DOWNSTREAM | | | | TOTAL | D |
| | | A1 | A2 | A3 | A4 | C1 | C2 | C3 | C4 | | | | |
| | |  |  |  |  |  |  |  |  | |  | | |
| GWP | kg CO ₂ eq | 5,62E+02 | 3,94E+01 | 1,50E+02 | 5,00E+01 | 3,81E+01 | 2,44E+01 | 2,01E+00 | 7,31E-01 | 8,67E+02 | 4,41E+02 | | |
| GWP,f | kg CO ₂ eq | 5,62E+02 | 3,93E+01 | 1,50E+02 | 5,00E+01 | 3,81E+01 | 2,44E+01 | 2,00E+00 | 7,30E-01 | 8,67E+02 | 4,41E+02 | | |
| GWP,b | kg CO ₂ eq | 2,13E-01 | 2,48E-03 | 2,06E-01 | 6,13E-03 | 2,68E-03 | 1,54E-03 | 6,09E-03 | 1,01E-04 | 4,38E-01 | 6,15E-02 | | |
| GWP,luluc | kg CO ₂ eq | 5,17E-02 | 3,15E-04 | 7,20E-02 | 1,45E-03 | 5,53E-04 | 1,95E-04 | 4,06E-03 | 1,79E-05 | 1,30E-01 | 4,38E-02 | | |
| ODP | kg CFC11 eq | 9,08E-05 | 9,21E-06 | 3,67E-06 | 1,16E-05 | 8,60E-06 | 5,72E-06 | 9,06E-08 | 1,53E-07 | 1,30E-04 | 1,32E-05 | | |
| AP | mol H+ eq | 2,07E+00 | 2,28E-01 | 3,48E-01 | 2,91E-01 | 4,12E-01 | 1,41E-01 | 1,01E-02 | 7,55E-03 | 3,51E+00 | 2,12E+00 | | |
| EP,f | kg P eq | 1,23E-02 | 2,36E-05 | 3,37E-03 | 7,82E-05 | 2,99E-05 | 1,47E-05 | 1,07E-04 | 2,67E-06 | 1,59E-02 | 2,64E-02 | | |
| EP,m | kg N eq | 3,93E-01 | 9,17E-02 | 1,17E-01 | 1,16E-01 | 1,85E-01 | 5,69E-02 | 1,84E-03 | 3,28E-03 | 9,65E-01 | 4,09E-01 | | |
| EP,t | mol N eq | 4,40E+00 | 1,01E+00 | 1,25E+00 | 1,28E+00 | 2,03E+00 | 6,25E-01 | 2,05E-02 | 3,59E-02 | 1,06E+01 | 4,62E+00 | | |
| POCP | kg NMVOC eq | 1,30E+00 | 2,62E-01 | 3,41E-01 | 3,32E-01 | 5,54E-01 | 1,62E-01 | 5,50E-03 | 1,00E-02 | 2,97E+00 | 2,26E+00 | | |
| ADPE | kg Sb eq | 2,11E-04 | 2,34E-06 | 5,92E-05 | 3,48E-06 | 1,70E-05 | 1,45E-06 | 1,23E-06 | 3,03E-07 | 2,96E-04 | 7,96E-03 | | |
| ADPF | MJ | 9,71E+03 | 5,62E+02 | 7,18E+02 | 7,17E+02 | 5,29E+02 | 3,49E+02 | 2,59E+01 | 9,75E+00 | 1,26E+04 | 3,56E+03 | | |
| WDP | m ³ | 2,60E+03 | -1,24E-01 | 1,89E+02 | -5,60E-02 | 1,02E-01 | -7,69E-02 | 3,00E-01 | 3,35E-03 | 2,79E+03 | 3,94E+01 | | |

GWP Global warming potential, total

GWP,f Global warming potential, fossil

GWP,b Global warming potential, biogenic

GWP,luluc Global warming potential, land use & land use change

ODP Ozone depletion potential

AP Acidification Potential

EP,f Eutrophication potential, freshwater

EP,m Eutrophication potential, marine

EP,t Eutrophication potential, terrestrial




POCP Photochemical ozone creation potential

ADPE Abiotic depletion potential minerals & metals

ADPF Abiotic depletion potential fossil fuels

WDP Water use deprivation potential

RESOURCE USE PER DECLARED UNIT

|  USE OF RENEWABLE MATERIAL RESOURCES | UNITS / D.U. | UPSTREAM | | CORE PROCESS | | | | DOWNSTREAM | | | | TOTAL |  D |
|---|--------------|---|---|---|---|---|---|---|---|-----------------|----------|-------|---|
| | | A1  | A2  | A3  | A4  | C1  | C2  | C3  | C4  | | | | |
| PERE | [MJ] | 5,09E+02 | 7,87E-01 | 1,10E+02 | 2,56E+00 | 8,03E-01 | 4,89E-01 | 2,98E+00 | 3,68E-02 | 6,27E+02 | 3,28E+02 | | |
| PERM | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | | |
| PERT | [MJ] | 5,09E+02 | 7,87E-01 | 1,10E+02 | 2,56E+00 | 8,03E-01 | 4,89E-01 | 2,98E+00 | 3,68E-02 | 6,27E+02 | 3,28E+02 | | |
| PENRE | [MJ] | 1,14E+04 | 5,49E+02 | 4,83E+02 | 7,02E+02 | 5,17E+02 | 3,41E+02 | 3,38E+01 | 9,73E+00 | 1,40E+04 | 5,29E+03 | | |
| PENRM | [MJ] | 0,00E+00 | 0,00E+00 | 3,66E+02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 3,66E+02 | 0,00E+00 | | |
| PENRT | [MJ] | 1,14E+04 | 5,49E+02 | 8,49E+02 | 7,02E+02 | 5,17E+02 | 3,41E+02 | 3,38E+01 | 9,73E+00 | 1,44E+04 | 5,29E+03 | | |
| SM | [kg] | 1,20E+03 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 1,20E+03 | 0,00E+00 | | |
| RSF | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | | |
| NRSF | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | | |
| FW | [m³] | 6,09E+01 | 1,11E-02 | 4,77E+00 | 2,18E-02 | 1,36E-02 | 6,92E-03 | 1,45E-02 | 2,92E-04 | 6,57E+01 | 8,26E-01 | | |

PERE Use of renewable primary energy excluding renewable primary energy resources used as raw materials

PERM Use of renewable primary energy resources used as raw materials

PERT Total use of renewable primary energy resources

PENRE Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials

PENRM Use of non-renewable primary energy resources used as raw materials

PENRT Total use of non-renewable primary energy resources











SM Use of secondary raw materials

RSF Use of renewable secondary fuels

NRSF Use of non-renewable secondary fuels

FW Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES

|  WASTE GENERATION AND TREATMENT | UNITS / D.U. | UPSTREAM | | CORE PROCESS | | | | DOWNSTREAM | | | | TOTAL | D  |
|---|---------------------|---|---|---|---|---|---|---|---|----------|-----------------|--------------|--|
| | |  A1 |  A2 |  A3 |  A4 |  C1 |  C2 |  C3 |  C4 | | | | |
| HWD | [kg] | 0,00E+00 | 0,00E+00 | 2,89E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 2,89E+00 | 0,00E+00 | |
| NHWD | [kg] | 0,00E+00 | 0,00E+00 | 8,34E+01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 8,34E+01 | 0,00E+00 | |
| RWD | [kg] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | |
| CRU | [kg] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | |
| MFR | [kg] | 0,00E+00 | 0,00E+00 | 1,26E+02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 1,26E+02 | 0,00E+00 | |
| MER | [kg] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | |
| EE | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | |

- HWD** Hazardous waste disposed
- NHWD** Non-hazardous waste disposed
- RWD** Radioactive waste disposed
- CRU** Components for re-use
- MFR** Materials for recycling
- MER** Materials for energy recovery
- EE** Exported energy



3. CALCULATION RULES

The environmental burden of the product has been calculated according to EN 15804:2012+A2:2019¹ and PCR ICMQ-001/15 v3. This declaration is a cradle to gate with options EPD type, based on the application of Life Cycle Assessment² (LCA) methodology to the whole life-cycle system.

In the whole LCA model, infrastructures and production equipments are not taken into account.

Hot rolled steel products at plant level, were described by using specific data from manufacturing facility (Brescia, Italy) for year 2020.

Customized LCA questionnaires were used to gather in-depth information about all aspects of the production system (for example, raw materials contents and specifications, pre treatments, process efficiencies, air and water emissions, waste management), in order to provide a complete picture of the environmental burden of the system from raw materials supply (A1) to Transport (A2) and Manufacturing (A3).

The use phase was not considered according to EN:15804 and PCR ICMQ-001/15 v3, while transport to final destination (A4) and end of life (C1-C2-C3-C4-D) were considered. The product is designed for being incorporated into concrete structures. Therefore, in nominal installation and operating conditions, no emissions to air nor to water shall occur.

According to ISO 14040 and 14044, allocation is avoided whenever possible by dividing the system into sub-systems. When allocation cannot be avoided physical properties are used to drive flow analysis.

Data quality has been assessed and validated during data collection process.

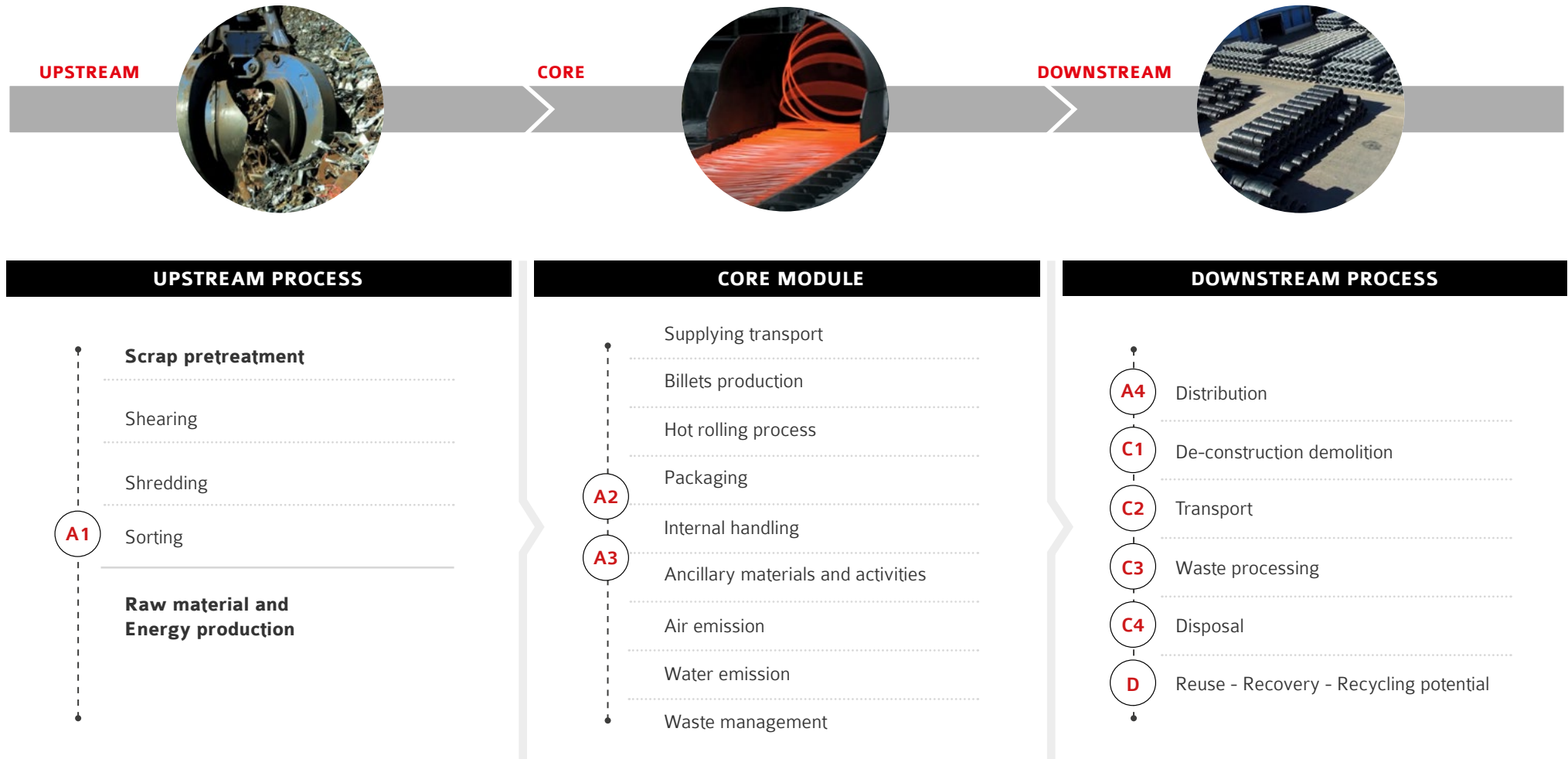
According to EN:15804 the applied cut-off criterion for mass and energy flows is 1%.

¹EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations
Core rules for the product category of construction products.

²The LCA methodology is standardized at international level by ISO 14040 and ISO 14044.

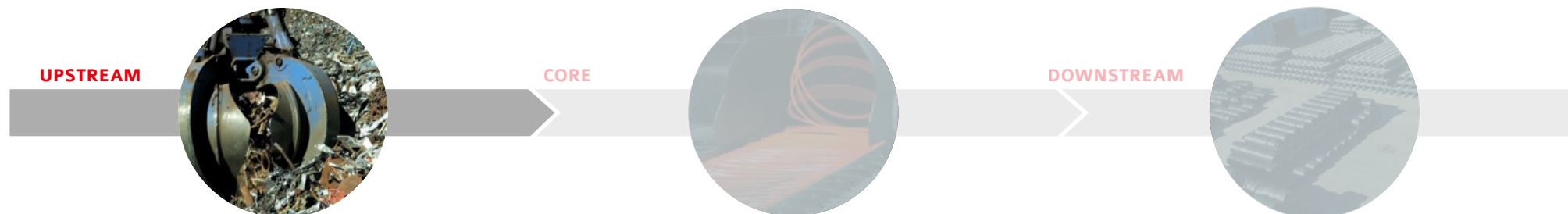


4. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

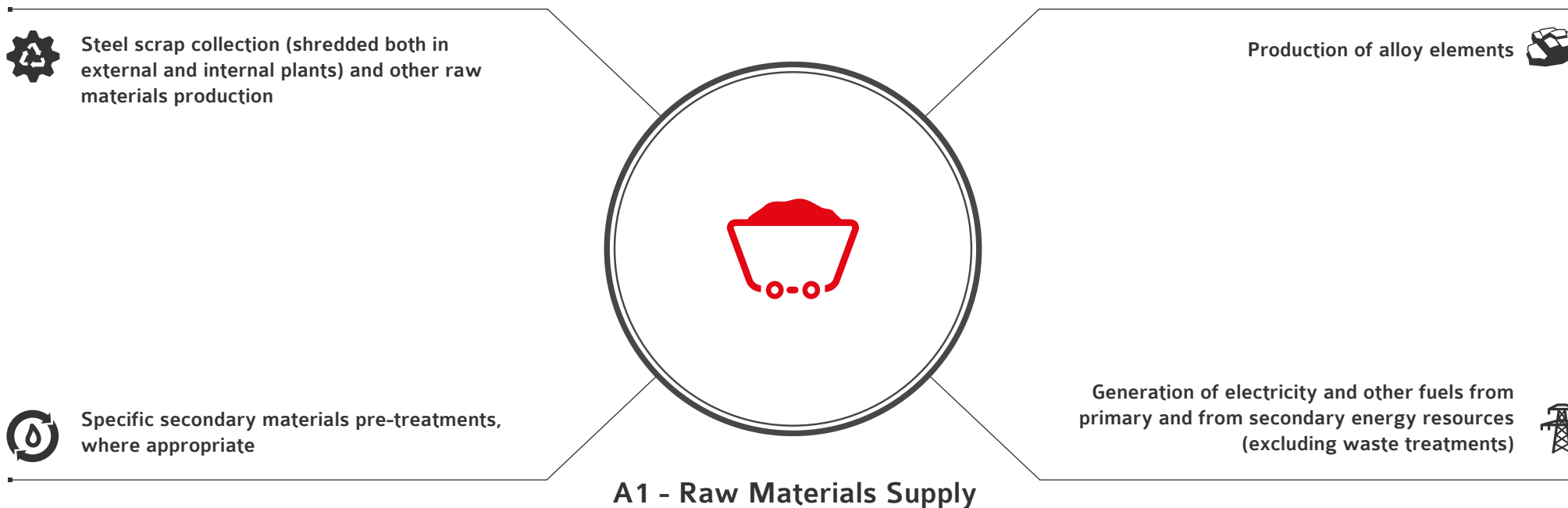


Broad scheme of hot-rolled reinforcing steel for concrete production, in which the main activities included in the system boundaries, are listed and divided in the three sub-systems: **UPSTREAM** Process, **CORE** Module and **DOWNSTREAM** Process.

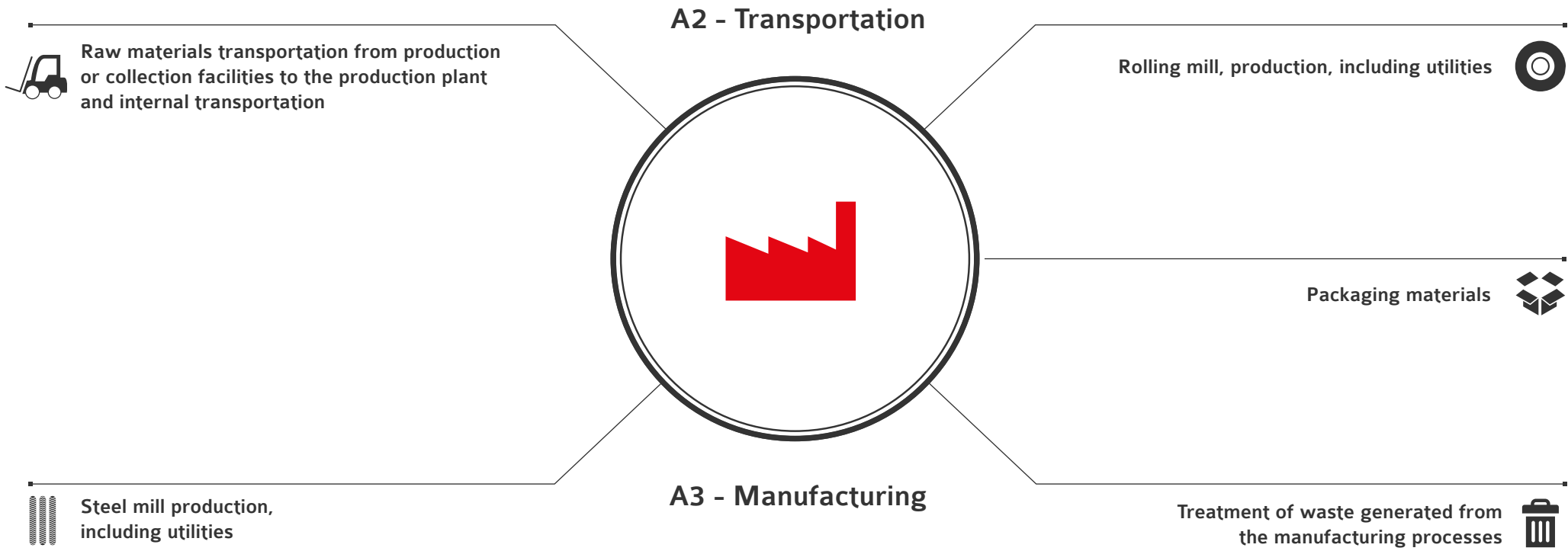
UPSTREAM PROCESS



Scheme of the considered system boundaries (upstream processes).



CORE PROCESS



DOWNSTREAM PROCESS



A4 Distribution

Transport to the customers (general market average). Distances estimated considering the transported quantities and the distances from Brescia plant to the client. From Brescia (in the North of Italy) final products are delivered to many national (69% of the total sold product) and international areas such as Germany (around 9%), France and Austria, mentioning the main countries.

The means of transport used to deliver steel bars and coils are truck and freight ship. On average, finished product is transported for 457 km by road and 547 km by ship.

C1 De-construction demolition

Dismantling and demolition operations required to remove the product from the building. Initial onsite sorting of the materials is included as well.

C2 Transport

Transportation of the discarded product as part of the waste processing (to recycling site or to a final disposal site).

C3 Waste processing

Waste processing, including collection of waste fraction from deconstruction and waste processing of material flows intended for reuse, recycling and energy recovery.

C4 Disposal

Waste disposal including physical pre-treatment and management of the disposal site.

D Reuse - Recovery - Recycling potential

Environmental impacts associated to waste use after the investigated system (including recycling).

In this module impacts arising from steel recycling are accounted, including avoided impacts associated to primary steel production. The result is expressed as net value between direct impact (i.e. recycling steel in EAF furnace) and avoided impact (i.e. producing steel from iron ore in BOF furnace).

5. OTHER OPTIONAL ADDITIONAL ENVIRONMENTAL INFORMATION

6. REFERENCES

- EN 15804:2012+A2:2019
- ISO 14040
- ISO 14044
- Life Cycle Assessment (LCA) for hot and cold rolled structural steel and for Sinstone recycled industrial aggregate produced by Alfa Acciai for EPD® purposes - Final Report
- EPDIItaly General Programme Information v5
- PCR ICMQ-001/15 v3

OTHER ENVIRONMENTAL CHARACTERISTICS OF ALFA ACCIAI PLANT

Alfa Acciai in Brescia is equipped with a scrap park (in which the steel scrap is sorted for the following crushing phase) and a section where steel scrap is prepared; there are also two casting lines, provided with air and water emissions treatment systems.

The plant has also a production line dedicated to long products. Alfa Acciai has committed to improve the environmental performance of its production process with different measures such as the ALFA 2000 project (an environmental mitigation measures under supervised by the Brescia Town Council), the installation of a new more powerful off-gas filtering system for furnace 1 and active carbons filters along the suction lines of both furnaces to further reduce the organic micro pollutants in air emissions. Alfa Acciai plant in Brescia is equipped with prevention and reduction systems for (PCDD /F) and PCB emissions, a recirculating loop cooling to minimize water consumption and a waste management plan to prevent and reduce waste generation.